WHAT IS CLAIMED IS:

1   1. A method of traffic regulation in a packet communication
2 network, the network including a traffic regulator for regulating traffic at the packet
3 level, the traffic regulator including a bucket mechanism, the bucket mechanism
4 including a token bucket associated with a subscriber, the token bucket being
5 configured to receive new tokens at a fill rate and configured with a bucket depth,
6 the method comprising:
7   handling packets that arrive at the regulator in accordance with the
8 token bucket configuration;
9   measuring a demand placed on the packet communication network by
10 the subscriber; and
11   dynamically adjusting the token bucket configuration for the
12 subscriber based on the demand.

1   2. The method of claim 1 wherein handling packets further
2 comprises:
3   handling packets that arrive at the regulator based on a current
4 number of tokens present in the token bucket.

1   3. The method of claim 2 wherein handling packets further
2 comprises:
3   handling a particular packet that arrives at the regulator in a normal
4 fashion when the current number of tokens present in the token bucket is sufficient,
5 otherwise, handling the particular packet that arrives at the regulator in a special
6 fashion.

1   4. The method of claim 3 wherein the special fashion of packet
2 handling is to drop the packet.

1   5. The method of claim 3 wherein the special fashion of packet
2 handling is to assign a classification to the packet.

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2 comprises:
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6. The method of claim 2 wherein handling packets further comprises:

handling a particular packet that arrives at the regulator based on the current number of tokens present in the token bucket by assigning a classification to the particular packet based on the current number of tokens present.

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7. The method of claim 6 wherein the assigning of the classification takes place in accordance with a predetermined relationship between number of tokens present in the token bucket and appropriate classification.

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8. The method of claim 6 wherein the assigning of the classification takes place in accordance with a probability mass function that determines the probability mass for each classification based on number of tokens present in the token bucket.

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9. The method of claim 1 wherein measuring the demand further comprises:

monitoring the number of tokens present in the token bucket.

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10. The method of claim 9 wherein measuring the demand further comprises:

determining a burst demand based on observations made while monitoring the number of tokens present in the token bucket over a period of time.

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11. The method of claim 1 wherein the bucket mechanism includes a second bucket arrangement associated with the subscriber, and wherein measuring the demand further comprises:

monitoring the second bucket arrangement.

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12. The method of claim 1 wherein measuring the demand further comprises:

3   measuring the demand placed on the packet communication network

4   by the subscriber for traffic in a different direction than the direction in which traffic

5   is regulated by the subscriber's token bucket.

1   13. The method of claim 1 wherein dynamically adjusting further

2   comprises:

3   modifying the bucket depth.

1   14. The method of claim 1 wherein handling packets further

2   comprises:

3   handling a particular packet that arrives at the regulator based on a

4   current number of tokens present in the token bucket by assigning a classification

5   to the particular packet according to a policy based on the current number of tokens

6   present; and

7   wherein dynamically adjusting further comprises:

8   modifying the policy to which the assigning of the classification

9   conforms.

1   15. The method of claim 14 wherein the policy to which the

2   assigning of the classification conforms is based on a predetermined relationship

3   between number of tokens present in the token bucket and appropriate classification.

1   16. The method of claim 14 wherein the policy to which the

2   assigning of the classification conforms is based on a probability mass function that

3   determines the probability mass for each classification based on number of tokens

4   present in the token bucket.

1   17. A method of traffic regulation in a packet communication

2   network, the network including a traffic regulator for regulating traffic at the packet

3   level, the traffic regulator including a bucket mechanism, the bucket mechanism

4   including a token bucket associated with a subscriber, the token bucket being

5   configured to receive new tokens at a fill rate and configured with a bucket depth,

6   the method comprising:

7   handling a particular packet that arrives at the regulator based on a
8   current number of tokens present in the token bucket by assigning a classification
9   to the particular packet according to a policy based on the current number of tokens
10   present;

11   measuring a demand placed on the packet communication network by
12   the subscriber by monitoring the number of tokens present in the token bucket; and

13   dynamically adjusting the token bucket configuration for the
14   subscriber based on the demand.

1   18. The method of claim 17 wherein measuring the demand further
2   comprises:

3   determining a burst demand based on observations made while
4   monitoring the number of tokens present in the token bucket over a period of time.

1   19. The method of claim 17 wherein dynamically adjusting further
2   comprises:

3   modifying the bucket depth.

1   20. The method of claim 17 wherein dynamically adjusting further
2   comprises:

3   modifying the policy to which the assigning of the classification
4   conforms.

1   21. A method of traffic regulation in a packet communication
2   network, the network including a traffic regulator for regulating traffic at the packet
3   level, the traffic regulator including a bucket mechanism, the bucket mechanism
4   including first and second token buckets associated with a subscriber, the first token
5   bucket being configured to receive new tokens at a first fill rate and configured with
6   a first bucket depth, the second token bucket being configured to receive new tokens
7   at a second fill rate and having a second bucket depth, the method comprising:

8   handling packets that arrive at the regulator in accordance with the
9   first and second token bucket configurations, wherein the first token bucket uses
10   tokens to regulate the packet flow in terms of packet rate and wherein the second

11   token bucket uses tokens to regulate the packet flow in terms of data rate such that

12   a particular packet is subjected to handling in accordance with both the first token

13   bucket and the second token bucket.

1   22. The method of claim 21 further comprising:

2   measuring a demand placed on the packet communication network by

3   the subscriber; and

4   dynamically adjusting the token bucket configurations for the

5   subscriber based on the demand.

1   23. A method of traffic regulation in a packet communication

2   network, the network including a traffic regulator for regulating traffic at the packet

3   level, the traffic regulator including a bucket mechanism, the bucket mechanism

4   including a token bucket associated with a subscriber, the token bucket being

5   configured to receive new tokens at a fill rate and configured with a bucket depth,

6   the method comprising:

7   handling packets that arrive at the regulator in accordance with the

8   token bucket configuration, wherein the token bucket uses tokens to regulate the

9   packet flow by removing tokens from the token bucket when handling packets, the

10   . amount of tokens to be removed being based on the amount of the flow and being

11   further based on a classification of the flow.

1   24. The method of claim 23 wherein the amount of tokens to be

2   removed is based on the amount of the flow in terms of data and is further based on

3   the classification of the flow.

1   25. The method of claim 24 wherein the amount of tokens to be

2   removed is based on the amount of the flow in terms of data and a multiplier that is

3   a function of the classification of the flow.

1   26. The method of claim 23 wherein the amount of tokens to be

2   removed is based on the amount of the flow in terms of packets and is further based

3   on the classification of the flow.

27. The method of claim 26 wherein the amount of tokens to be removed is based on the amount of the flow in terms of packets and a multiplier that is a function of the classification of the flow.

28. The method of claim 23 further comprising:

measuring a demand placed on the packet communication network by the subscriber; and

dynamically adjusting the token bucket configurations for the subscriber based on the demand.

29. A packet-level device for traffic regulation in a packet communication network, the packet-level device including a traffic regulator for regulating traffic at the packet level, the traffic regulator including a bucket mechanism, the bucket mechanism including a token bucket associated with a subscriber, the token bucket being configured to receive new tokens at a fill rate and configured with a bucket depth, the packet-level device being programmed to:

handle packets that arrive at the regulator in accordance with the token bucket configuration;

measure a demand placed on the packet communication network by the subscriber; and

dynamically adjust the token bucket configuration for the subscriber based on the demand.

30. The device of claim 29 wherein handling packets further comprises:

handling packets that arrive at the regulator based on a current number of tokens present in the token bucket.

31. The device of claim 30 wherein handling packets further comprises:

handling a particular packet that arrives at the regulator in a normal fashion when the current number of tokens present in the token bucket is sufficient,

5   otherwise, handling the particular packet that arrives at the regulator in a special

6   fashion.

1   32.   The device of claim 31 wherein the special fashion of packet

2   handling is to drop the packet.

1   33.   The device of claim 31 wherein the special fashion of packet

2   handling is to assign a classification to the packet.

1   34.   The device of claim 30 wherein handling packets further

2   comprises:

3   handling a particular packet that arrives at the regulator based on the

4   current number of tokens present in the token bucket by assigning a classification

5   to the particular packet based on the current number of tokens present.

1   35. The device of claim 34 wherein the assigning of the classification

2   takes place in accordance with a predetermined relationship between number of

3   tokens present in the token bucket and appropriate classification.

1   36. The device of claim 34 wherein the assigning of the classification

2   takes place in accordance with a probability mass function that determines the

3   probability mass for each classification based on number of tokens present in the

4   token bucket.

1   37. The device of claim 29 wherein measuring the demand further

2   comprises:

3   monitoring the number of tokens present in the token bucket.

1   38. The device of claim 37 wherein measuring the demand further

2   comprises:

3   determining a burst demand based on observations made while

4   monitoring the number of tokens present in the token bucket over a period of time.

1   39. The device of claim 29 wherein the bucket mechanism includes
2   a second bucket arrangement associated with the subscriber, and wherein measuring
3   the demand further comprises:
4   monitoring the second bucket arrangement.

1   40. The device of claim 29 wherein measuring the demand further
2   comprises:
3   measuring the demand placed on the packet communication network
4   by the subscriber for traffic in a different direction than the direction in which traffic
5   is regulated by the subscriber's token bucket.

1   41. The device of claim 29 wherein dynamically adjusting further
2   comprises:
3   modifying the bucket depth.

1   42. The device of claim 29 wherein handling packets further
2   comprises:
3   handling a particular packet that arrives at the regulator based on a
4   current number of tokens present in the token bucket by assigning a classification
5   to the particular packet according to a policy based on the current number of tokens
6   present; and
7   wherein dynamically adjusting further comprises:
8   modifying the policy to which the assigning of the classification
9   conforms.

1   43. The device of claim 42 wherein the policy to which the assigning
2   of the classification conforms is based on a predetermined relationship between
3   number of tokens present in the token bucket and appropriate classification.

1   44. The device of claim 42 wherein the policy to which the assigning
2   of the classification conforms is based on a probability mass function that determines
3   the probability mass for each classification based on number of tokens present in the
4   token bucket.

1   45.   A packet-level device for traffic regulation in a packet

2 communication network, the packet-level device including a traffic regulator for

3 regulating traffic at the packet level, the traffic regulator including a bucket

4 mechanism, the bucket mechanism including a token bucket associated with a

5 subscriber, the token bucket being configured to receive new tokens at a fill rate and

6 configured with a bucket depth, the packet-level device being programmed to:

7   handle a particular packet that arrives at the regulator based on a

8 current number of tokens present in the token bucket by assigning a classification

9 to the particular packet according to a policy based on the current number of tokens

10 present;

11   measure a demand placed on the packet communication network by

12 the subscriber by monitoring the number of tokens present in the token bucket; and

13   dynamically adjust the token bucket configuration for the subscriber

14 based on the demand.

1   46. The device of claim 45 wherein measuring the demand further

2 comprises:

3   determining a burst demand based on observations made while

4 monitoring the number of tokens present in the token bucket over a period of time.

1   47. The device of claim 45 wherein dynamically adjusting further

2 comprises:

3   modifying the bucket depth.

1   48. The device of claim 45 wherein dynamically adjusting further

2 comprises:

3   modifying the policy to which the assigning of the classification

4 conforms.

1   49.   A packet-level device for traffic regulation in a packet

2 communication network, the packet-level device including a traffic regulator for

3 regulating traffic at the packet level, the traffic regulator including a bucket

4   mechanism, the bucket mechanism including first and second token buckets

5   associated with a subscriber, the first token bucket being configured to receive new

6   tokens at a first fill rate and configured with a first bucket depth, the second token

7   bucket being configured to receive new tokens at a second fill rate and having a

8   second bucket depth, the packet-level device being programmed to:

9   handle packets that arrive at the regulator in accordance with the first

10   and second token bucket configurations, wherein the first token bucket uses tokens

11   to regulate the packet flow in terms of packet rate and wherein the second token

12   bucket uses tokens to regulate the packet flow in terms of data rate such that a

13   particular packet is subjected to handling in accordance with both the first token

14   bucket and the second token bucket.

1   50. The device of claim 49 further programmed to:

2   measure a demand placed on the packet communication network by

3   the subscriber; and

4   dynamically adjust the token bucket configurations for the subscriber

5   based on the demand.

1   51. A packet-level device of traffic regulation in a packet

2   communication network, the packet-level device including a traffic regulator for

3   regulating traffic at the packet level, the traffic regulator including a bucket

4   mechanism, the bucket mechanism including a token bucket associated with a

5   subscriber, the token bucket being configured to receive new tokens at a fill rate and

6   configured with a bucket depth, the packet-level device being programmed to:

7   handle packets that arrive at the regulator in accordance with the

8   token bucket configuration, wherein the token bucket uses tokens to regulate the

9   packet flow by removing tokens from the token bucket when handling packets, the

10   amount of tokens to be removed being based on the amount of the flow and being

11   further based on a classification of the flow.

1   52. The device of claim 51 wherein the amount of tokens to be

2   removed is based on the amount of the flow in terms of data and is further based on

3   the classification of the flow.

1   53. The device of claim 52 wherein the amount of tokens to be
2 removed is based on the amount of the flow in terms of data and a multiplier that is
3 a function of the classification of the flow.

1   54. The device of claim 51 wherein the amount of tokens to be
2 removed is based on the amount of the flow in terms of packets and is further based
3 on the classification of the flow.

1   55. The device of claim 54 wherein the amount of tokens to be
2 removed is based on the amount of the flow in terms of packets and a multiplier that
3 is a function of the classification of the flow.

1   56. The device of claim 51 further being programmed to:
2   measure a demand placed on the packet communication network by
3 the subscriber; and
4   dynamically adjust the token bucket configurations for the subscriber
5 based on the demand.